RF/RMRS-99-439 UN

QUARTERLY REPORT
FOR THE
MOUND SITE PLUME TREATMENT PROJECT

July through September 1999

September 22,1999

1/19

INTRODUCTION

The Mound Site Plume Treatment System collects and treats the contaminated groundwater plume derived from the Mound Site to the Groundwater Action Level Framework Tier 11 level concentrations defined in the Rocky Flats Cleanup Agreement (RFCA) (DOE, 1996) and demonstrates the feasibility of using this system on other contaminated groundwater plumes The components of the Mound Site Plume System are shown on Figure 1

The Mound Site Plume Treatment Project was a cooperative effort between RFETS and the Department of Energy Subsurface Contaminant Focus Area (EM-50), with support from the US Environmental Protection Agency (EPA) SITE Program The Mound Site Plume Treatment Project employs innovative technology for the collection and treatment of contaminated groundwater containing chlorinated organic contamination and low levels of radionuclides

This report covers the activity and available data for the quarter from July 1, 1999, to September 30, 1999 Included in this report are the analytical results for samples collected during the previous quarter, but which were not available for the last report There are no safety issues for this reporting period

PROJECT EVENTS

Raking of the iron in the two treatment cells continues along with water level monitoring and sample collection by the EPA SITE Program (performed by Tetra Tech) Each of the two treatment cells contain 4 feet of iron filings that act as the treatment medium for the contaminated water Most of the crest that developed at the top of the iron in Reactor Cell 1 was removed last quarter The remaining crust material was broken up on July 16, 1999 A mixture of 10% iron and 90°/0 pea gravel was added to Reactor 1 on July 19, 1999 to bring the media up to the original level This material is easier to rake than the previous 50/50 mixture of gravel and iron

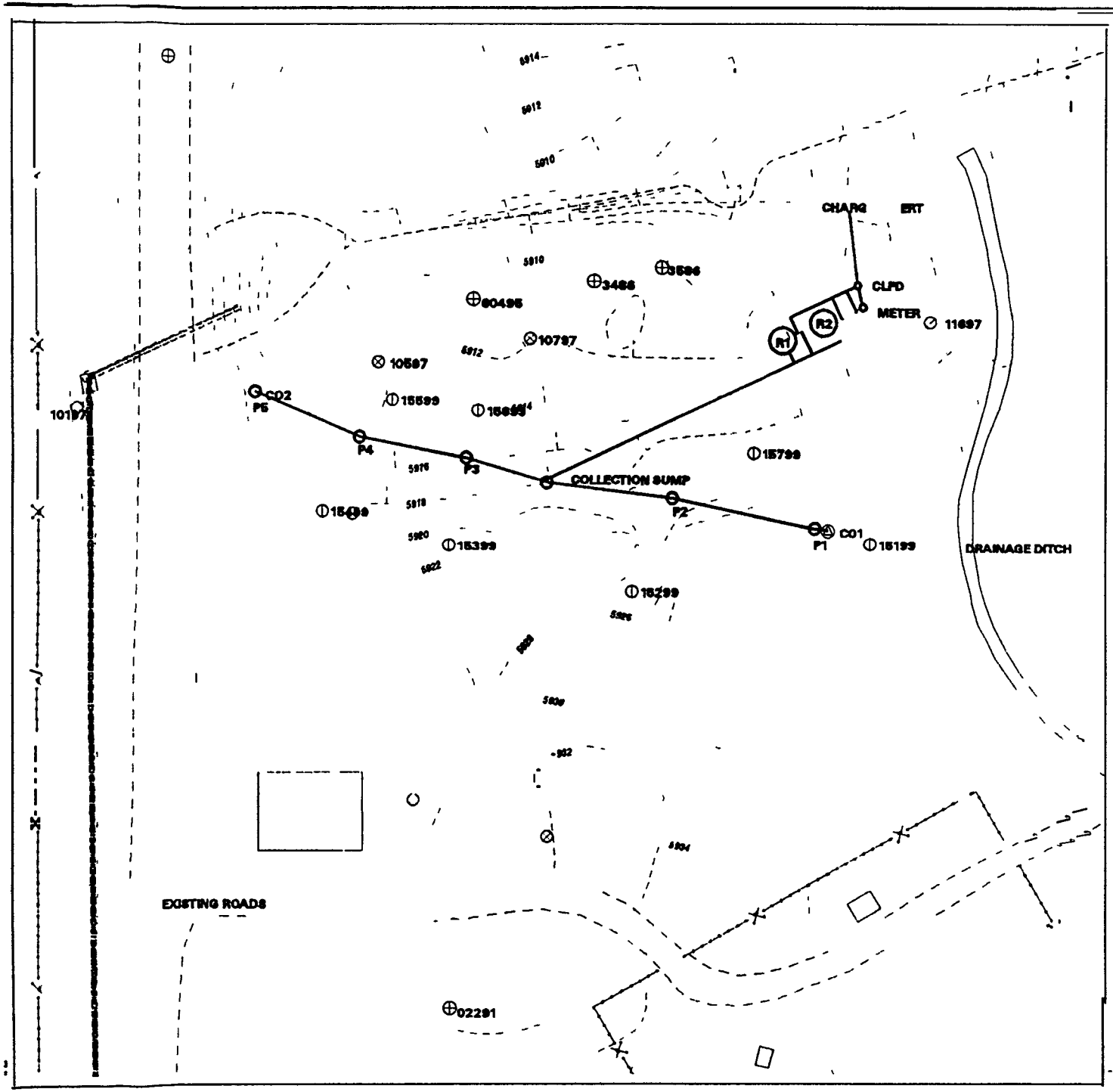
Analytical results from the crust material were received and indicate that it is composed primarily of clay minerals Crust and iron samples were collected on July 27, 1999 and were later sent to the University of California, Riverside for research purposes

Approximately 60 visitors attended Visitor's Day for the Mound Site Plume, which was held on July 8, 1999 There were several presentations and a tour of the Mound Site Plume collection and treatment system as well as the other groundwater remediation projects

TREATMENT EFFECTIVENESS

Treatment system flow rates for the July through September period are shown on Figure 2 Total flow volume through the system as of September 19, 1999, was 228,720 gallons of water The volume for June 18, 1999 though September 19, 1999 was 84,613 gallons The recorded flow rate ranged from 0 47 to 0 98 gallons per minute and averaged 0 63 gallons per minute

Water levels within the collection trench are monitored by five piezometers (P 1 through P5) Locations are shown on Figure 1 with the results shown in Table 1 Water levels from the piezometers upgradient and downgradient of the collection trench were measured quarterly These results are also shown in Table 1 The July 1999 trench piezometer water level measurements are nearly identical to the July 1998 water level measurements, indicating that the system is functioning normally



BARRIER WALL AND TREATMENT SYSTEM LOCATIONS

Figure 1

Rocky Flats Environmental Technology Site

EXPLANATION

Detailed Key

- New Ground Water Well
- Existing Ground Water Well
- New Trench Water-Level Monitoring Probes
- Geoprobe
- New Trench Cleanout
- Contours
- Fences
- 72" Culvert
- Trench System

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Paved roads
- Dirt roads

Scale = 1 : 870
1 inch represents approximately 50 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

RMRS Rocky Mountain Remediation Services, L.L.C.

99-0223 June

_8vr w /projects/fy99/99-0223/brenda_zm.eml

3 Best Available Copy

Figure 2: Mound Plume Treatment System Flow Rates-Fourth Quarter

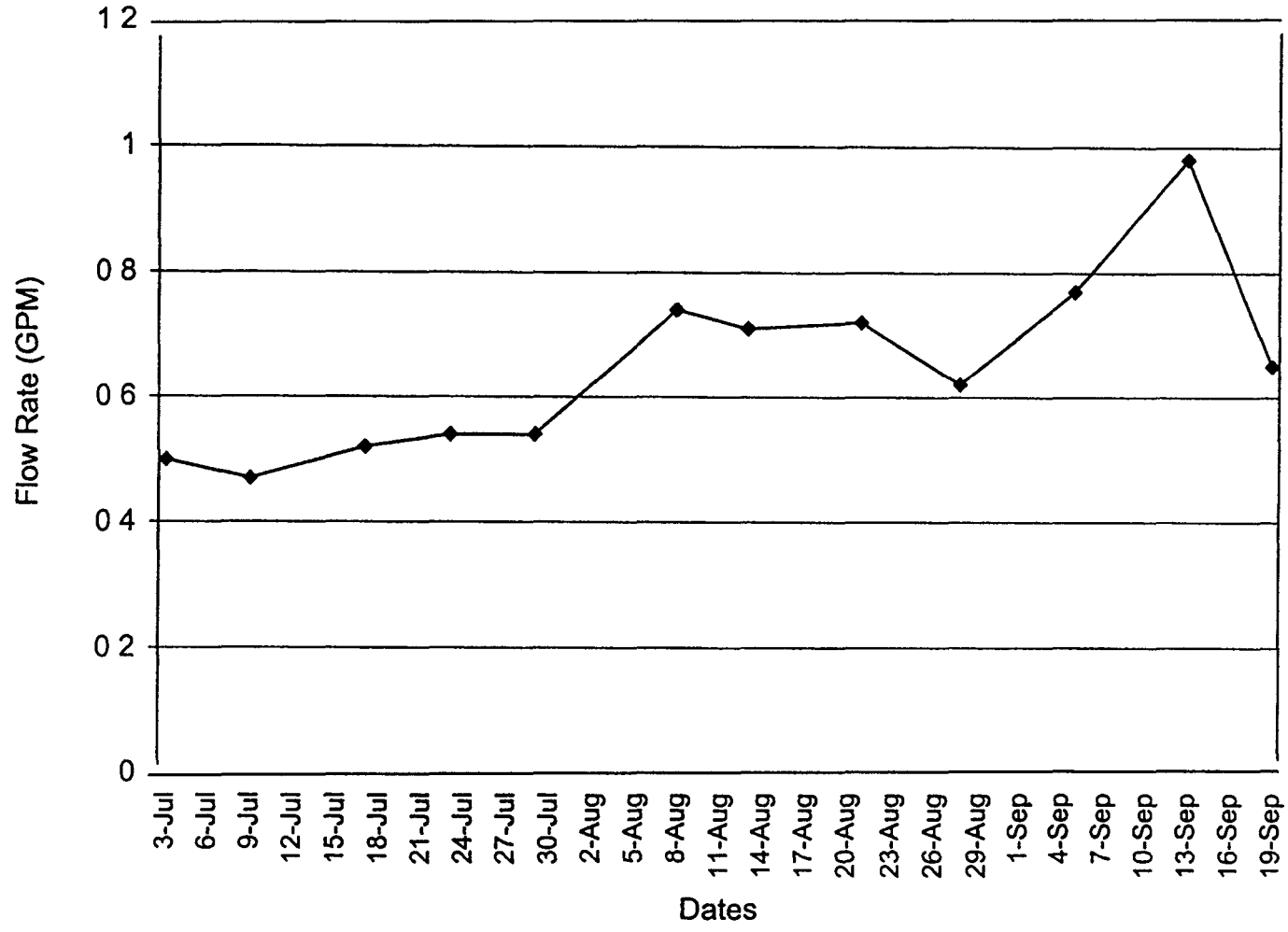


Table 1 Mound Plume Piezometer water levels (in feet below top of casing)

Trench Piezometers	Groundwater Piezometers						
	717199	8/4/99	8/31/99		7/6/99	8/2/99	9/1/99
PI (East)	PB	Dry	Dry	15199	5 57	NM	NM
P2	PB	11 88	11 91	15299	11 32	NM	NM
P3	PB	9 48	9 42	15399	3 40	NM	NM
P4	PB	9 53	9 51	15499	2 17	NM	NM
P5 (West)	PB	12 51	12 49	15599	Dry	NM	NM
Collection Sump	PB	8 62	8 62	15699	8 29	NM	NM
				15799	9 69	NM	NM
				3586	7 79	7 52	7,53

NM = Not measured
PB = Probe broken, no measurement taken

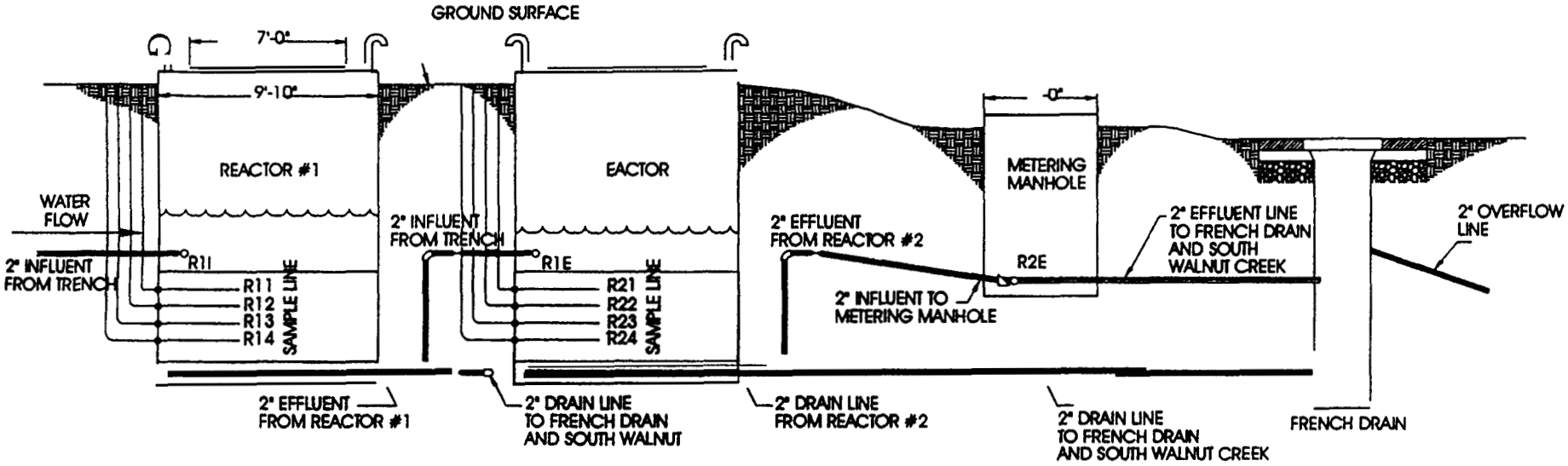
Influent and effluent samples along with samples for the locations within the first treatment cell were collected on both July 7, 1999 and on August 4, 1999 for volatile organic compounds (VOCs) and radionuclides The results indicate that most of the VOCS and radionuclides are removed within the first foot of reactive iron Figure 3 shows the sampling locations within the treatment cells Samples were not collected within the second treatment cell because of the efficiency with which the first treatment cell is removing contaminants The sample results received this quarter are provided in Appendices A and B As of the report date, the data have not been verified or validated and a data quality assessment has not been conducted

July 7, 1999 Sampling Event· When the crust in the first treatment cell was removed in June, the top of the media dropped to a level close to the first sampling port Therefore, there wasn't the sharp reduction in the contaminants of concern typically seen between the influent and the first sampling port However, the contaminant concentrations entering the first treatment cell are significantly reduced by the time the treated water leaves the system as shown in Table 2 and Figure 4 All effluent results were below the RFCA Tier II Groundwater Action Levels

Table 2 Summary of the July 7, 1999 Sampling Event

Contaminant	Influent (RI 1) Concentration (ug/l)	Effluent from Reactor 1 (RI E) Concentrations (ug/l)	Effluent from Reactor 2 (R2E) Concentrations (ug/l)	RFCA Groundwater Tier II Action levels (ug/l)
Carbon Tetrachlonde	71	ND	ND	5
Chloroform	17	3 6	1 4	100
1,1 -Dichloroethene	10	1 3	ND	7
Cis 1,2-Dichloroethene	35	12	6 5	70
1,2-Dichloroethene (total)	35	12	6 5	70
Methylene Chloride	1 8 JB	1 9 JB	0 94 JB	5
Tetrachloroethene	59 0	1 7	ND	5
1,1,1 -Trichloroethane	7 3	ND	ND	200
Trichloroethene	140	1 7	ND	5

ND = Not detected at the detection limit for this analysis
J = Detected below detection limit for analysis
B = Detected in blank



LEGEND

- REACTIVE IRON
- SAMPLE LOCATION
- WATER LINE
- SAMPLE LINE

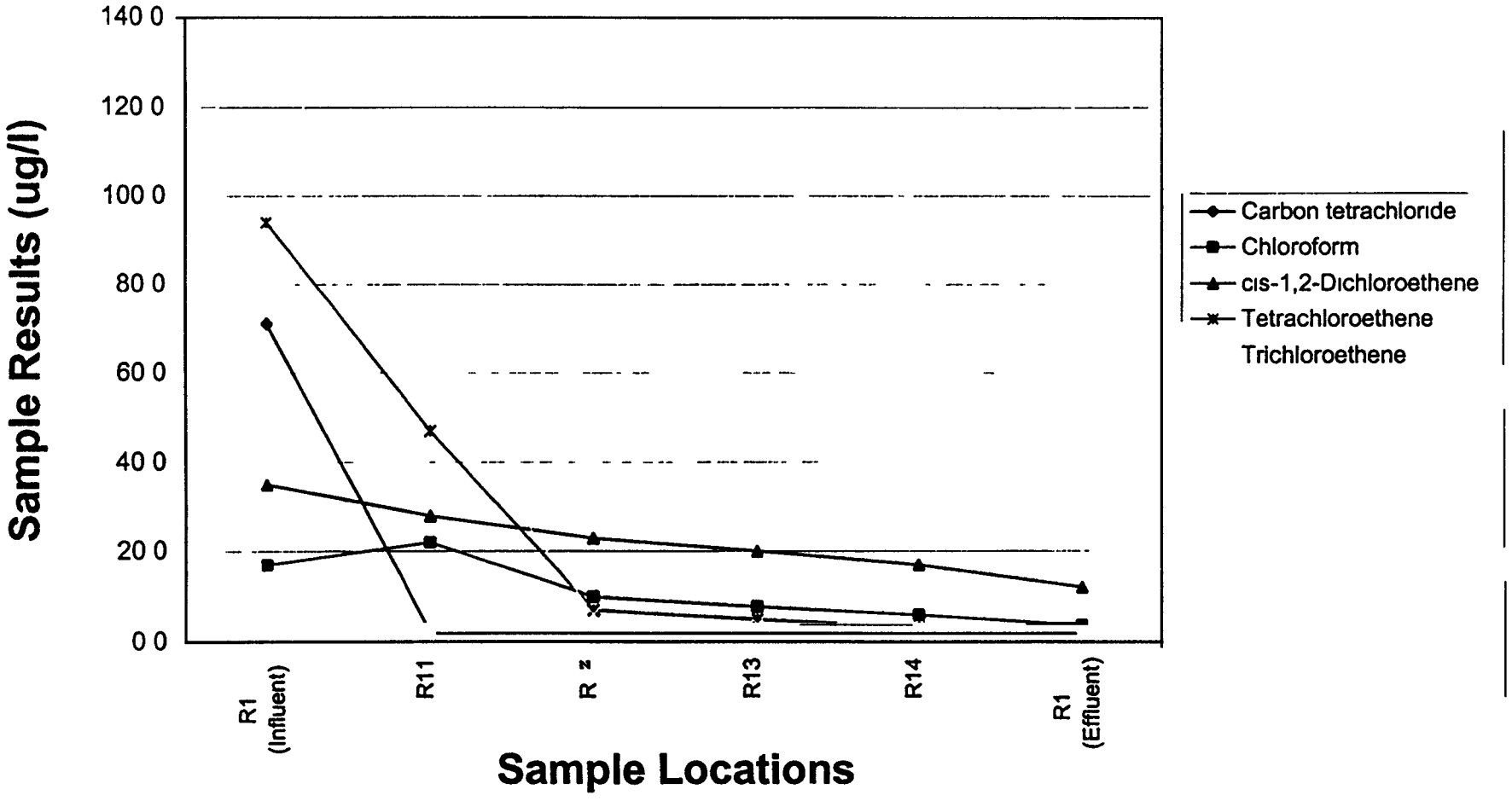
NOT TO SCALE

Figure 3
Sample locations within the Treatment Cells

RMRS
Rocky Mountain Remediation Services L L C
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
PO Box 464
Golden, CO 80402-0464

99-0318

Figure 4. MOUND PLUME TREATMENT RESULTS By Sample Locations - 7/7/99



August 4, 1999 Sampling Event: The influent contaminant concentrations are reduced to well below the RFCA Tier II Groundwater Action Levels prior to the treated water leaving the first treatment cell The primary contaminants of concern (carbon tetrachloride tetrachloroethene and trichloroethene) are at non-detectable concentrations prior to the treated water exiting the treatment system Sample results are provided in Table 3 and Figure 5

Table 3 Summary of the August 4, 1999 Sampling Event

Contaminant	Influent(R11) Concentration (ug/l)	Effluent from Reactor 1 (R1 E) Concentrations (ug/l)	Effluent from Reactor 2 (R2E) Concentrations (ug/l)	RFCA Groundwater Tier I I Action levels (ug/l)
Carbon Tetrachloride	53	ND	ND	5
Chloroform	13	4 J	1 4 J	100
Cis 1,2-dichloroethene	30	11	4 8	70
1,1,1 -Trichloroethane	6	ND	ND	200
Tetrachloroethene	70	1 5	ND	5
Trichloroethene	110	1 5	ND	5

ND = Not detected at the detection limit for this analysis
J = Detected below detection limit for analysis

Radiological Results. Radiological analyses received this quarter are provided in Appendix B The radiological contaminants of concern identified in the Mound Site-Plume Decision Document (DOE 1997) were total uranium and americium-241 Americium samples were not collected at the influent locations

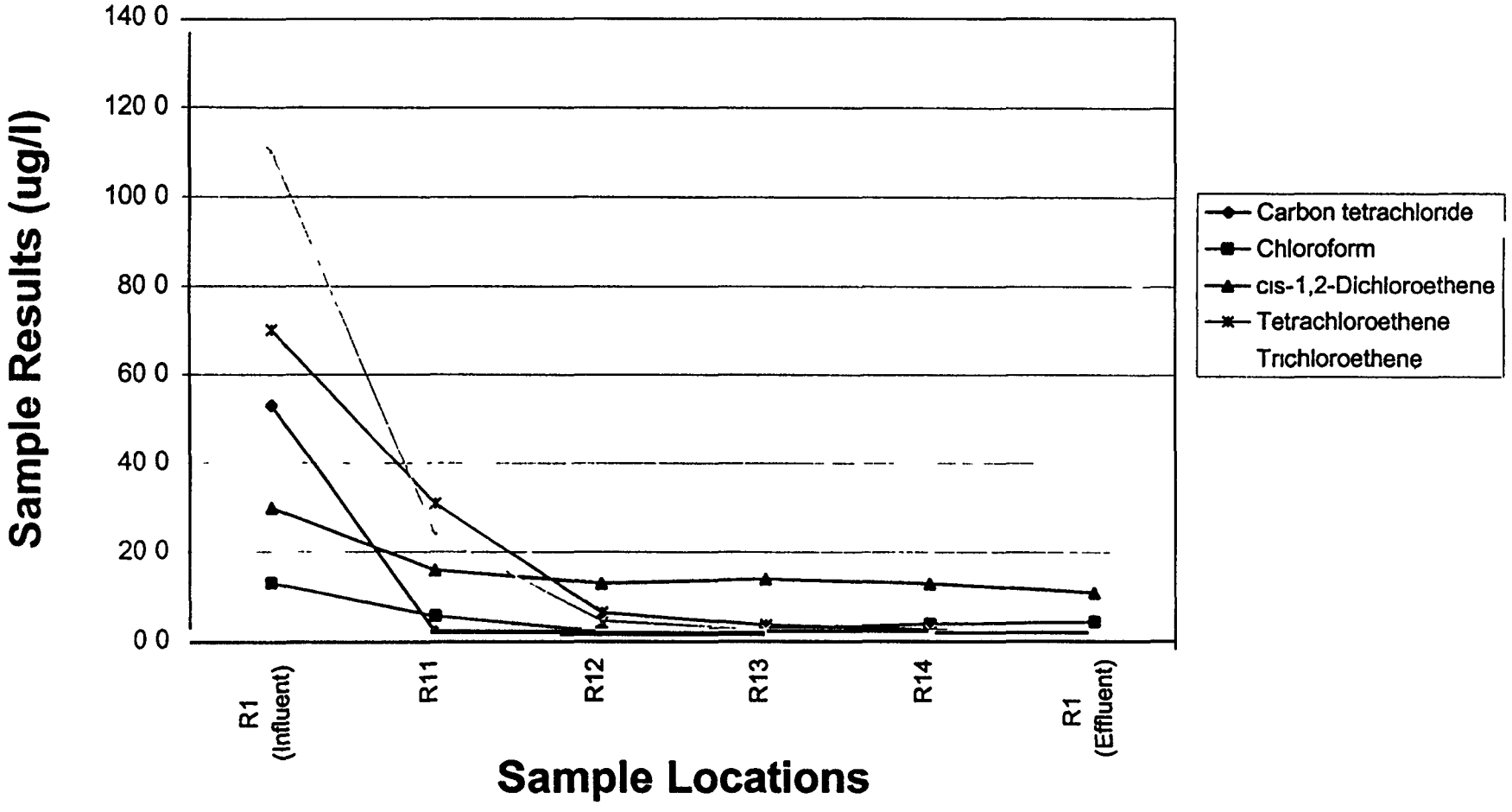
May 25 1999 Sampling Event The total uranium analyses were provided in units of weight per liter rather than activity, however, the data show a marked decrease from influent to effluent sampling locations The average total uranium concentration at the influent to the first treatment cell was 24 6 ug/l. At the sampling port one foot into the iron, the total uranium concentration had declined to 0 036 ug/l The effluent from the treatment system measured 0 198 ug/l Using a conversion factor of 0 677 pCi/ug, which was provided by the lab that performed the analysis, these values roughly equate to 16 65 pCi/l at the influent sample location and decline to 0 134 pCi/l at the effluent sample location This effluent concentration is well below the RFCA Tier II action level of 10 pCi/l The americium-241 concentration at the effluent location was 0 0012 pCi/l, significantly below the RFCA Tier II action level of 0 145 pCi/l

July 7 1999 Sampling Event Uranium analyses were provided in pCi/l and the average uranium concentration at the influent to the first treatment cell was approximate y 12 pCi/l and declined to 0 0996 pCi/l at the system effluent location This effluent concentration is well below the RFCA Tier II action level of 10 pCi/l The americium-241 concentration at the effluent location was 0 0434 pCi/l, significantly below the RFCA Tier II action level of 0 145 pCi/l

August 4, 1999 Sampling Event The uranium analyses were provided in units of weight rather than activity, however, the data show a marked decrease from influent to effluent sampling locations The average uranium concentration at the influent to the first treatment cell was approximately 13 ug/l The effluent from the treatment system measured 0 033 ug/l Using a conversion factor of 0 677 pCi/ug, which was provided by the lab that performed the analysis, these values roughly equate to 8 67 pCi/l at the influent sample location and decline to 0 02 pCi/l at the effluent sample location This effluent concentration is well below the RFCA Tier II action level of 10 pCi/l The americium-241 concentration at the effluent location was 0 004 pCi/l, significantly below the RFCA Tier II action level of 0 145 pCi/l

8

Figure 5. MOUND PLUME TREATMENT RESULTS By Sample Locations - 8/4/99



CONCLUSIONS

The Mound Site Plume Treatment Project is fully operational and treating contaminated groundwater to below the specified system performance requirements Ongoing maintenance, raking the iron filings and retrieving flow rate and water level data are the only required activities Sampling will continue at regular intervals to verify the performance of the treatment system For the next quarter, October through December 1999, no changes in the system are expected

REFERENCES

DOE, 1996, *Final Rocky Flats Cleanup Agreement,* Rocky Flats Environmental Technology Site, Golden, CO, July

DOE, 1997, Final *Mound Site Plume Decision Document, RF/RMRS-97-024,* September

APPENDIX A - Mound Plume Treatment System Analytical Results (Preliminary) in ug/l

	Top of Reactor 1		Top of Reactor 1		Top of Reactor 1		Reactor 1 Sample Line		Reactor 1 Sample Line		Reactor 1 Sample Line		Reactor 1 Sample Line		Reactor 1 Sample Line	
Location/Date	7/7/99		7/7/99		7/7/99		7/7/99		7/7/99		7/7/99		7/7/99		7/7/99	
Sample Number	ET R10-S-01 7799		ETI-R10-S-02 7799		ETI-R10-S-03-7799		ETI-R11 S-01 7799		ETI-R11 S-02 7799		ETI R11 S-03-7799		ETI-R12 S-01 7799		ETI R13-S-01 7799	
Parameter	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit
Acetone	5 JB	40	ND JB	40	ND JB	40	ND	10 0	ND	10 0	ND	10 0	2 4 JB	10 0	ND	10 0
Benzene	ND	4 0	ND	4 0	ND	4 0	0 17 J	1 0	0 16 J	1 0	0 16 J	1 0	0 23 J	1 0	0 25 J	1 0
Bromodichloromethane	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Bromoform	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Bromomethane	ND	8 0	ND	8 0	ND	8 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0
2-Butanone (MEK)	ND	20	ND	20	ND	20	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0
Carbon disulfide	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Carbon tetrachloride	71	8 4	72	8 4	73	8 4	ND	2 1	ND	2 1	ND	2 1	ND	2 1	ND	2 1
Chlorobenzene	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
	ND	8 0	ND	8 0	ND	8 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0
Chloroform	17	2 0	17	2 0	17	2 0	22 0	0.5	22	0 5	22	0 5	10 0	0 5	7 8	0 5
Chloromethane	ND	8 0	ND	8 0	ND	8 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0
Dibromochloromethane	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
1 1 Dichloroethane	1 6 J	4 8	1 7 J	4 8	1 7 J	4 8	1 9	1.2	1 8	1 2	1 9	1.2	2 0	1.2	2 0	1 2
1,2 Dichloroethane	1 0 J	4 0	1 1 J	4 0	1 2 J	4 0	0 93 J	1 0	0 95 J	1 0	0 97 J	1 0	0 96 J	1 0	0 88 J	1 0
1 1 Dichloroethene	10	4 0	10	4 0	10	4 0	6 4	1 0	6 6	1 0	6 4	1 0	2 8	1 0	2 5	1 0
cis-1 2 Dichloroethene	35	4 8	36	4 8	35	4 8	28	1.2	27	1.2	28	1 2	23 0	1 2	20 0	1 2
trans 1 2-Dichloroethene	ND	2 0	ND	2 0	ND	2 0	ND	0 5	ND	0 5	ND	0 5	ND	0 5	ND	0 5
1,2 Dichloroethene (total)	35	4 0	36	4 0	35	4 0	28	1 0	27	1 0	28	1 0	23 0	1 0	20 0	1 0
1,2-Dichloropropane	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
cis-1 3-Dichloropropene	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
trans-1 3-Dichloropropene	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Ethylbenzene	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
2-Hexanone	ND	20	ND	20	ND	20	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0
Methylene chloride	8 JB	20	1 8 JB	20	1 7 JB	20	1 8 JB	5 0	1 7JB	5 0	1 7 JB	5 0	2 8 JB	5 0	3 1 JB	5 0
4-Methyl-2-pentanone	ND	20	ND	20	ND	20	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0
Styrene	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
1 1 2,2 Tetrachloroethane	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Tetrachloroethene	94	5 6	91	5 6	94	5 6	47	1 4	50	1 4	45 0	1 4	7 1	1 4	5 0	1 4
Toluene	ND	4 0	ND	4 0	ND	4 0	0 17 J	1 0	0 18 J	1 0	0 16 J	1 0	0 17 J	1 0	0 13 J	1 0
1 1 1 Trichloroethane	7.3	3 2	7 4	3 2	7 4	3.2	1 8	0 8	2 1	0 8	1 8	0 8	ND	0 8	ND	0 8
1 1 2-Trichloroethane	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Trichloroethene	140	4 0	140	4 0	140	4 0	55	1 0	59	1 0	54	1 0	6.2	1 0	3 9	1 0
Vinyl chloride	ND	4 4	ND	4 4	ND	4 4	0.25 J	1 1	0.24 J	1 1	0.26 J	1 1	0 33 J	1 1	0 37 J	1 1
Xylenes (total)	ND	4 0	ND	4 0	ND	4 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0

APPENDIX A - Mound Plume Treatment System Analytical Results (Preliminary) in ug/l

	Reactor 1 Sample Line								Top of Reactor 1		Top of Reactor 1		Top of Reactor 1	
Sample Number	ETI R14 S-01 7899		ETI-R1E S-01 7899		ETI-R2E-C-01 7899		ETI-R10-T-01 7899		ET R10-F-01 7899		ETI-R10-S-01-8499		ETI-R10-S-02-8499		ET R10-S-03-8499	
Parameter	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit
Acetone	ND JB	10 0	3 1 JB	10 0	5.5 JB	10 0	ND	10 0	3 6 JB	10 0	ND	33	ND	40	ND	33
Benzene	0 25 J	1 0	0 19 J	1 0	0.26 J	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
Bromodichloromethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
Bromoform	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	0.52 J	3 3	ND	4 0	ND	3 3
	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	6 7	ND	8 0	ND	6 7
2-Butanone (MEK)	ND	5 0	ND	5 0	2 8 J	5 0	ND	5 0	ND	5 0	ND	17	ND	20	ND	17
Carbon disulfide	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
Carbon tetrachloride	ND	2 1	ND	2 1	ND	2 1	ND	2 1	ND	2 1	53	7 0	53	8 4	52	7 0
Chlorobenzene	0 16 J	1 0	0 13 J	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
Chloroethane	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	6 7	ND	8 0	ND	6 7
Chloroform	5 9	0 5	3 6	0 5	0 31 J	0 5	ND	0 5	ND	0 5	13	1 7	12	2 0	11	1 7
Chloromethane	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	6 7	ND	8 0	ND	6 7
Dibromochloromethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
1 1 Dichloroethane	1 9	1 2	1 5	1.2	1 4	1.2	ND	1.2	ND	1.2	17 J	4 0	14 J	4 8	14 J	4 0
1 2-Dichloroethane	0 91 J	1 0	0 76 J	1 0	0 64 J	1 0	ND	1 0	ND	1 0	14 J	3 3	ND	4 0	ND	3 3
1 1 Dichloroethene	2 0	1 0	1 3	1 0	ND	1 0	ND	1 0	ND	1 0	6 3	3 3	7.6	4 0	7 7	3 3
cis-1,2-Dichloroethene	17 0	1.2	12 0	1.2	6 5	1.2	ND	1.2	ND	1 2	30	4 0	26	4 8	27	4 0
trans 1,2-Dichloroethene	ND	0 5	ND	0 5	ND	0 5	ND	0 5	ND	0 5	ND	1 7	ND	2 0	ND	1 7
1 2 Dichloroethene (total)	17 0	1 0	12 0	1 0	6 5	1 0	ND	1 0	ND	1 0	30	3 3	26	4 0	27	3 3
1 2 Dichloropropane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
cis-1 3-Dichloropropene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
trans-1 3-Dichloropropene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	0.36 J	3 3	ND	4 0	ND	3 3
Ethylbenzene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3
2-Hexanone	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	3.2 J	17	ND	20	ND	17
Methylene chloride	3 0 JB	5 0	1 9 JB	5 0	0 94 JB	5 0	0.23 JB	5 0	0 21 JB	5 0	5 5 JB	17	9 JB	20	4 1 JB	17
4-Methyl-2-pentanone	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	17	ND	20	ND	17
Styrene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	0 43 J	3 3	ND	4 0	ND	3 3
1,1,2,2-Tetrachloroethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	0 81 J	3 3	ND	4 0	ND	3 3
Tetrachloroethene	3.2	1 4	1 7	1 4	ND	1 4	ND	1 4	ND	1 4	70	4 7	71	5 6	71	4 7
Toluene	ND	1 0	0 13 J	1 0	0 19 J	1 0	ND	1 0	ND	1 0	0 50 J	3 3	ND	4 0	ND	3 3
1 1 1-Trichloroethane	ND	0 8	ND	0 8	ND	0 8	ND	0 8	ND	0 8	6	2 7	5 1	3 2	5 6	2 7
1 1,2-Trichloroethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	0 71 J	3 3	ND	4 0	ND	3 3
Trichloroethene	3 0	1 0	2.2	1 0	ND	1 0	ND	1 0	ND	1 0	110	3 3	120	4 0	110	3 3
Vinyl chloride	0 35 J	1 1	ND	1 1	0.27 J	1 1	ND	1 1	ND	1 1	ND	3 7	ND	4 4	ND	3 7
Xylenes (total)	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	3 3	ND	4 0	ND	3 3

12

APPENDIX A - M Treatment System Analytical Results (Preliminary) in ug/l

	Reactor 1 Sample Line R11		Reactor 1 Sample Line R11		Reactor 1 Sample Line R11		Reactor 1 Sample Line R12		Reactor 1 Sample Line R13		Reactor 1 Sample Line R14		Reactor 1 (Effluent)		Reactor 2 (Effluent)	
Location/Date	8/4/99		8/4/99		8/4/99		8/4/99		8/4/99		8/4/99		8/4/99		8/4/99	
Sample Number	ETI-R11-S-01-8499		ETI-R11-S-02-8499		ETI-R11 S-03-8499		ETI-R12-S-01-8499		ETI-R13-S-01-8499		ETI-R14-S-01-8499		ETI-R1E S-01-8499		ETI-R2E-C-01-8499	
Parameter	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit	Result	Detection Limit
Acetone	ND	10 0	ND	10 0	ND	10 0	2.5 J	10 0	ND	10 0	ND	10 0	ND	10 0	ND	10 0
Benzene	0 17 J	1 0	0 18 J	1 0	0 17 J	1 0	0.25 J	1.0	0.28 J	1 0	0.29 J	1 0	0 19 J	1 0	0 35 J	1 0
Bromodichloromethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Bromoform	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Bromomethane	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0
2-Butanone (MEK)	ND	5 0	ND	5 0	ND	5 0	ND	5 0	3 1 JB	5 0	ND	5 0	ND	5 0	1 4 J	5 0
Carbon disulfide	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Carbon tetrachloride	ND	2 1	ND	2 1	ND	2 1	ND	2 1	ND	2 1	ND	2 1	ND	2 1	ND	2 1
Chlorobenzene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Chloroethane	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0
Chloroform	5 8	0 5	4.9	0 5	6 5	0.5	2.3	0 5	2 9	0 5	4 1	0 5	4 5	0 5	0 14 J	0 5
Chloromethane	0.34 J	2 0	0.22 J	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0	ND	2 0
Dibromochloromethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
1 1-Dichloroethane	1.5	1.2	1 4	1.2	1 6	1.2	1.3	1.2	1.3	1.2	1 4	1.2	1 4	1.2	1 4	1.2
1 2-Dichloroethane	0 71 J	1 0	0.54 J	1 0	0 66 J	1 0	0 61 J	1 0	0 66 J	1 0	0 66 J	1 0	0 64 J	1 0	0 66 J	1 0
1 1 Dichloroethene	2 9	1 0	2 6	1 0	3 1	1 0	1 5	1 0	1 7	1 0	1 7	1 0	1.2	1 0	ND	1 0
cis 1 2-Dichloroethene	16	1.2	13	1.2	16	1.2	13 0	1.2	14 0	1.2	13 0	1.2	11 0	1 2	4 8	1.2
trans-1,2-Dichloroethene	ND	0 5	ND	0 5	ND	0 5	ND	0.5	ND	0 5	ND	0 5	ND	0 5	ND	0 5
1,2-Dichloroethene (total)	16	1 0	13	1 0	16	1 0	13 0	1 0	14 0	1 0	13 0	1 0	11 0	1 0	4 8	1 0
1,2-Dichloropropane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
cis-1,3-Dichloropropene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
trans-1 3-Dichloropropene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Ethylbenzene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
2 Hexanone	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0
Methylene chloride	1 5 JB	5 0	2 0 JB	5 0	1 7 JB	5 0	1 7 JB	5 0	2.2 JB	5 0	2.5 JB	5 0	1 5 JB	5 0	0 87 JB	5 0
4-Methyl-2-pentanone	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0	ND	5 0
Styrene	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
1 1,2 2 Tetrachloroethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Tetrachloroethene	31	1 4	32	1 4	33	1 4	6 5	1 4	3 8	1 4	2 8	1 4	1 5	1 4	ND	1 4
Toluene	0 19 J	1 0	0.22 J	1 0	0.23 J	1 0	0.22 J	1 0	0.23 J	1 0	0.21 J	1 0	0 22 J	1 0	0 26 J	1 0
1 1 1-Trichloroethane	ND	0 8	ND	0 8	ND	0 8	ND	0 8	ND	0 8	ND	0 8	ND	0 8	ND	0 8
1 1 2-Trichloroethane	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0
Trichloroethene	24	1 0	24	1 0	26	1 0	4 7	1 0	2 8	1 0	2 7	1 0	1 5	1 0	ND	1 0
Vinyl chloride	0 31 J	1 1	0 28 J	1 1	0 32 J	1 1	0.28 J	1 1	0 31 J	1 1	0 32 J	1 1	0.29 J	1 1	0 27 J	1 1
Xylenes (total)	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0	ND	1 0

APPENDIX A - Mou n[e] Plume Treatment System Analytical Results (Preliminary) in

	Trip Blank		Field Blank	
Location/Date	8/4/99		8/4/99	
Sample Number	ETI-R10-T-01-8499		ETI-R10-F-01-8499	
Parameter	Result	Detection Limit	Result	Detection Limit
Acetone	ND	10 0	4 8 J	10 0
Benzene	ND	1 0	ND	1 0
Bromodichloromethane	ND	1 0	ND	1 0
Bromoform	ND	1 0	ND	1 0
Bromomethane	ND	2 0	ND	2 0
2-Butanone (MEK)	ND	5 0	ND	5 0
Carbon disulfide	ND	1 0	ND	1 0
Carbon tetrachloride	ND	2 1	ND	2 1
Chlorobenzene	ND	1 0	ND	1 0
Chloroethane	ND	2 0	ND	2 0
Chloroform	ND	0 5	ND	0 5
Chloromethane	ND	2 0	ND	2 0
Dibromochloromethane	ND	1 0	ND	1 0
1 1 Dichloroethane	ND	1.2	ND	1.2
1,2 Dichloroethane	ND	1 0	ND	1 0
1 1-Dichloroethene	ND	1 0	ND	1 0
cis-1,2-Dichloroethene	ND	1.2	ND	1.2
trans-1 2-Dichloroethene	ND	0 5	ND	0 5
1,2-Dichloroethene (total)	ND	1 0	ND	1 0
1 2-Dichloropropane	ND	1 0	ND	1 0
cis-1 3-Dichloropropene	ND	1 0	ND	1 0
trans-1 3-Dichloropropene	ND	1 0	ND	1 0
Ethylbenzene	ND	1 0	ND	1 0
2 Hexanone	ND	5 0	ND	5 0
Methylene chloride	0 69 JB	5 0	0 21 JB	5 0
4-Methyl-2-pentanone	ND	5 0	ND	5 0
Styrene	ND	1 0	ND	1 0
1 1,2,2-Tetrachloroethane	ND	1 0	ND	1 0
Tetrachloroethene	ND	1 4	ND	1 4
Toluene	ND	1 0	ND	1 0
1 1 1 Trichloroethane	ND	0 8	ND	0 8
1 1 2 Trichloroethane	ND	1 0	ND	1 0
Trichloroethene	ND	1 0	ND	1 0
Vinyl chloride	ND	1 1	ND	1 1
Xylenes (total)	ND	1 0	ND	1 0

4y

Appendix B

Sample Results Summary

Quanterra, Richland

Date: 7/6/99

REPORT No. . 8126

SDG NBR 12345

CLIENT ID	WORK ORDER NUMBER	PARAMETER	RESULT	UNITS	YIELD	MDA
ETI-R10-S-01 52599	CWC9H101	TOTAL-URANIUM	2.49E+01 +- 2.97E+00 (1s)	ug/L		7.29E-02
ETI-R10-S-01 52599	CWC9H102	TOTAL-URANIUM	2.33E+01 +- 2.79E+00 (1s)	ug/L		7.29E-02
ETI-R10-S-02 52599	CWC9K101	TOTAL-URANIUM	2.40E+01 +- 1.94E+00 (1s)	ug/L		7.29E-02
	CWC9K102	TOTAL-URANIUM	1.98E+02 +- 1.60E+01 (1s)	ug/L		7.29E-02
ETI-R10-S-03 52599	CWC9L101	TOTAL-URANIUM	2.48E+01 +- 2.00E+00 (1s)	ug/L		7.29E-02
ETI-R11-S-01 52599	CWC9M101	TOTAL-URANIUM	3.98E-02 +- 4.76E-03 (1s)	ug/L		7.29E-02
ETI-R11-S-02 52599	CWC9N101	TOTAL-URANIUM	3.26E-02 +- 4.03E-03 (1s)	ug/L		7.29E-02
ETI-R11-S-03 52599	CWC9Q101	TOTAL-URANIUM	3.24E-02 +- 3.88E-03 (1s)	ug/L		7.29E-02
ETI-R12-S-01 52599	CWC9T101	TOTAL URANIUM	2.21E-02 +- 3.25E-03 (1s)	ug/L		7.29E-02
ETI-R13-S-01 52599	CWC9X101	TOTAL-URANIUM	1.78E-02 +- 2.16E-03 (1s)	ug/L		7.29E-02
ETI-R14-S-01 52599	CWCA2101	TOTAL-URANIUM	1.16E-02 +- 1.70E-03 (1s)	ug/L		7.29E-02
ETI-R1E-S-01 52599	CWCA3101	TOTAL-URANIUM	1.28E-01 +- 1.04E-02 (1s)	ug/L		7.29E-02
ETI-R2E-C-01 52599	CWCA5105	PU-238	0.00E+00 +- 4.14E-02 (1s)	pCi/L	93.00%	9.16E-02
ETI-R2E-C-01 52599		PU239/40	0.00E+00 +- 4.14E-02 (1s)	pCi/L	93.00%	9.16E-02
ETI-R2E-C-01 52599	CWCA5102	ALPHA	-2.15E-01 +- 2.93E-01 (1s)	pCi/L	100.00%	2.41E+00
ETI-R2E-C-01 52599	CWCA5103	BETA	2.65E+00 +- 7.93E-01 (1s)	pCi/L	100.00%	2.93E+00
ETI-R2E-C-01 52599	CWCA5101	TOTAL-URANIUM	1.98E-01 +- 2.35E-02 (1s)	ug/L		7.29E-02
ETI-R2E-C-01 52599	CWCA5204	AM-241	1.17E-03 +- 2.11E-03 (1s)	pCi/L	98.58%	1.10E-02
ETI-R2E-C-01 52599	CWCA5106	ALPHA	6.49E-01 +- 5.22E-01 (1s)	pCi/L	100.00%	2.03E+00
ETI-R2E-C-01 52599	CWCA5107	BETA	2.11E+00 +- 7.34E-01 (1s)	pCi/L	100.00%	2.83E+00
ETI-R2E-C-01 52599	CWCA5108	PU-238	-5.64E-03 +- 3.95E-03 (1s)	pCi/L	91.66%	1.58E-01
ETI-R2E-C-01 52599		PU239/40	0.00E+00 +- 4.24E-02 (1s)	pCi/L	91.66%	9.38E-02

Comments: CID ETI-R2E-C-01 52599 DUP, LOT J9E28015812 v2.3

Sample Results Summary

Date 8/11/99

Quanterra, Richland

REPORT No. : 8380

SDG NBR: 12576

CLIENT ID	WORK ORDER NUMBER	PARAMETER	RESULT	UNITS	YIELD	MDA
ETI-R10-S-01-7799	CXVJT101	TOTAL-URANIUM	1.20E+01 +- 9.70E-01 (1s)	pCi/L		5.02E-02
	CXVJT102	TOTAL-URANIUM	2.29E+02 +- 2.71E+01 (1s)	pCi/L		5.02E-02
ETI-R10-S-02-7799	CXVK4101	TOTAL-URANIUM	1.23E+01 +- 1.46E+00 (1s)	pCi/L		5.02E-02
ETI-R10-S-03-7799	CXVK7101	TOTAL-URANIUM	1.21E+01 +- 1.43E+00 (1s)	pCi/L		5.02E-02
ETI-R11-S-01-7799	CXVK9101	TOTAL-URANIUM	2.85E-02 +- 4.18E-03 (1s)	pCi/L		5.02E-02
ETI-R11-S-02 7799	CXVKA101	TOTAL-URANIUM	1.32E-02 +- 1.94E-03 (1s)	pCi/L		5.02E-02
ETI-R11-S-03-7799	CXVKC101	TOTAL-URANIUM	1.57E-02 +- 1.89E-03 (1s)	pCi/L		5.02E-02
ETI-R12-S-01-7799	CXVKD101	TOTAL-URANIUM	3.15E-03 +- 4.83E-04 (1s)	pCi/L		5.02E-02
ETI-R13-S-01 7799	CXVKE101	TOTAL-URANIUM	1.89E-02 +- 2.02E-03 (1s)	pCi/L		5.02E-02
ETI-R13-S-01-7799 D	CXVKE102	TOTAL-URANIUM	3.52E-03 +- 5.17E-04 (1s)	pCi/L		5.02E-02
ETI-R14-S-01-7899	CXVKG101	TOTAL-URANIUM	4.44E-03 +- 6.52E-04 (1s)	pCi/L		5.02E-02
ETI-R1E-S-01-7899	CXVKH101	TOTAL URANIUM	5.77E-02 +- 6.86E-03 (1s)	pCi/L		5.02E-02
ETI-R2E-C-01-7899	CXVKJ105	PU-238	2.29E-03 +- 2.30E-03 (1s)	pCi/L	73.96%	6.21E-03
ETI-R2E-C-01-7899		PU239/40	-1.83E-03 +- 1.30E-03 (1s)	pCi/L	73.96%	1.57E-02
ETI-R2E-C-01-7899	CXVKJ104	AM-241	4.34E-02 +- 1.00E-02 (1s)	pCi/L	77.44%	1.14E-02
ETI-R2E-C-01-7899	CXVKJ102	ALPHA	1.09E+00 +- 8.27E-01 (1s)	pCi/L	100.00%	2.01E+00
ETI-R2E-C-01-7899	CXVKJ101	TOTAL-URANIUM	9.98E-02 +- 1.19E-02 (1s)	pCi/L		5.02E-02
ETI-R2E-C-01-7899	CXVKJ203	BETA	3.75E+00 +- 8.26E-01 (1s)	pCi/L	100.00%	2.85E+00
ETI-R2E-C-01-7899 D	CXVKJ106	ALPHA	4.72E-01 +- 4.41E-01 (1s)	pCi/L	100.00%	1.89E+00
ETI-R2E-C-01-7899 D	CXVKJ207	BETA	2.96E+00 +- 7.95E-01 (1s)	pCi/L	100.00%	2.91E+00
BLANK QC	D04TX101	TOTAL-URANIUM	1.90E-03 +- 2.80E-04 (1s)	pCi/L		5.02E-02
BLANK QC	D04W4101	ALPHA	4.78E-01 +- 2.52E-01 (1s)	pCi/L	100.00%	7.78E-01
BLANK QC	D04W9101	BETA	1.16E+00 +- 6.18E-01 (1s)	pCi/L	100.00%	2.52E+00

Comments: CID:INTRA-LAB BLANK, 9G 50000422 v2.3

0117

17

Sample Results Summary

Quanterra, Richland

Date 9/8/99

REPORT No. : 8586

SDG NBR. 12794

CLIENT ID	WORK ORDER NUMBER	PARAMETER	RESULT	UNITS	YIELD	MDA
ET F-0 -8499	292	TAL-URANIUM	_ 3E-03 _ .E-04 (...)	-g/L		(.29E-02
ETI-R10-S-01-8499	D127H101	TOTAL-URANIUM	1.27E+01 +- 1.50E+00 (1s)	ug/L		7.29E-02
ETI-R10-S-01-8499 D	D127H102	TOTAL-URANIUM	1.29E+01 +- 1.53E+00 (1s)	ug/L		7.29E-02
ETI-R10-S-02-8499	D127Q101	TOTAL-URANIUM	1.34E+01 +- 1.59E+00 (1s)	ug/L		7.29E-02
	D127Q102	OTAL-URANIUM	2.80E+02 +- 2.11E+01 (1s)	ug/L		7.29E-02
ETI-R10-S-03-8499	D1280101	TOTAL- RANIUM	1.33E+01 +- 1.59E+00 (1s)	ug/L		7.29E-02
ETI-R11-S-01-8499	D1282101	TOTAL-URANIUM	1.34E-02 +- 1.82E-03 (1s)	ug/L		7.29E-02
ETI-R11-S-02-8499	D1286101	TOTAL-URANIUM	1.12E-02 +- 1.65E-03 (1s)	ug/L		7.29E-02
ETI-R11-S-03-8499	D128A101	TOTAL-URANIUM	1.69E-02 +- 2.05E-03 (1s)	ug/L		7.29E-02
ETI-R12-S-01-8499	D128F101	TOTAL-URANIUM	9.27E-03 +- 1.38E-03 (1s)	ug/L		7.29E-02
ETI-R13-S-01-8499	D128J101	TOTAL-URANIUM	1.54E-03 +- 2.27E-04 (1s)	ug/L		7.29E-02
ETI-R14-S-01-8499	D128M101	TOTAL-URANIUM	1.52E-03 +- 2.23E-04 (1s)	ug/L		7.29E-02
ETI-R1E-S-01-8499	D128R101	TOTAL-URANIUM	5.51E-02 +- 6.54E-03 (1s)	ug/L		7.29E-02
ETI-R2E-C-01-8499	D1294105	AM-241	4.02E-03 +- 3.35E-03 (1s)	pCi/L	89.11%	1.26E-02
ETI-R2E-C-01-8499	D1294104	PU-238	2.34E-03 +- 2.35E-03 (1s)	pCi/L	72.37%	6.34E-03
ETI-R2E-C-01-8499		PU239/40	1.40E-03 +- 2.52E-03 (1s)	pCi/L	72.37%	1.32E-02
ETI-R2E-C-01-8499	D1294102	ALPHA	1.07E+00 +- 8.31E-01 (1s)	pCi/L	100.00%	2.08E+00
ETI-R2E-C-01-8499	D1294103	BETA	5.51E+00 +- 9.34E-01 (1s)	pCi/L	100.00%	2.90E+00
ETI-R2E-C-01-8499	D1294101	TOTAL-URANIUM	3.32E-02 +- 3.98E-03 (1s)	ug/L		7.29E-02
ETI-R2E-C-01-8499 D	D1294106	ALPHA	1.40E+00 +- 7.35E-01 (1s)	pCi/L	100.00%	2.27E+00
ETI-R2E-C-01-8499 D	D1294107	BETA	2.13E+00 +- 7.54E-01 (1s)	pCi/L	100.00%	2.93E+00
ETI-R2E-C-01-8499 D	D1294108	PU-238	-1.91E-03 +- 1.36E-03 (1s)	pCi/L	76.28%	1.64E-02
ETI-R2E-C-01-8499 D		PU239/40	2.36E-03 +- 2.39E-03 (1s)	pCi/L	76.28%	8.46E-03

Comments CID.ETI-R2E-C-01-8499 DUP, LOT.J9H06017112 v2.4

18

Sample Results Summary

Quanterra, Richland

Date: 9/8/99

REPORT No.: 8586

SDG NBR: 12704

CLIENT ID	WORK ORDER NUMBER	PARAMETER	RESULT	UNIT	YIELD	MDA
ET R2 -84	84 09	M-24	82E-02 ...5E ...	pCi/L	84 89%	...9E-0...
BLANK QC	D15XL101	TOTAL-URANIUM	1.09E-03 +- 1.60E-04 (1s)	ug/L		7.29E-02
BLANK QC	D1617101	ALPHA	1.82E-01 +- 2.08E-01 (1s)	pCi/L	100.00%	9.70E-01
BLANK QC	D1618101	BETA	1.03E+00 +- 8.32E-01 (1s)	pCi/L	100.00%	2.62E+00
BLANK QC	D161A101	PU-238	-3.21E-03 +- 1.62E-03 (1s)	pCi/L	86.88%	1.72E-02
BLANK QC		PU239/40	-8.02E-04 +- 8.04E-04 (1s)	pCi/L	86.88%	1.13E-02
BLANK QC	D161C101	AM-241	6.35E-03 +- 3.83E-03 (1s)	pCi/L	86.08%	9.96E-03
LCS	D15XL102	TOTAL-URANIUM	9.71E+01 +- 1.15E+01 (1s)	ug/L		7.29E-02
LCS	D1617102	ALPHA	2.07E+01 +- 2.57E+00 (1s)	pCi/L	100.00%	8.81E-01
LCS	D1618102	BETA	2.53E+01 +- 2.13E+00 (1s)	pCi/L	100.00%	2.55E+00
LCS	D161A102	PU-238	-4.27E-03 +- 1.94E-03 (1s)	pCi/L	79.05%	1.98E-02
LCS		PU239/40	4.66E+00 +- 3.77E-01 (1s)	pCi/L	79.05%	5.78E-03
LCS	D161C102	AM-241	4.48E+00 +- 3.57E-01 (1s)	pCi/L	91.87%	4.55E-03

Number of Results: 36

8000

Comments: CID:INTRA-LAB CHECK, LOT J9H100000329 v2.4

19/19